farm machinery costs as a guide to custom rates

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PREFACE

Since 1975, Alberta Agriculture has annually undertaken to provide information on the cost of owning and operating farm machinery.

This publication provides technical information on current machinery prices, repair rates, performance capacity, fuel consumption and price. The information is organized into fixed and variable costs to provide a basis for budgeting machinery costs. The cost calculations are intended to be used as approximate cost figures. It is recommended that adjustments be made as desired to suite individual situations. In addition the 1988 custom rates have been included for comparison.

We gratefully acknowledge the services of Cal Ausenhus who again conducted the machinery cost survey. Lacey Lambert and Garth Nickorick from the Farm Business Management Branch of Alberta Agriculture also contributed to updating this publication. The Market Rate Survey data was provided from a joint-project with Statistics Branch.

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INTRODUCTION

This publication outlines steps in the identification of costs incurred by some of the machinery units used in field and livestock operations.

HOW TO USE THE GUIDE

1. If you are a full-time custom operator, then use the Total Machine Cost + Labor + Profit for estimating a charge. Be sure to adjust fixed costs if your annual hours of use differ much from those quoted. The profit margin can be adjusted to meet the market conditions.

2. If you are doing custom work on a good neighbor payment basis, then fixed costs of the machine may be ignored since they represent an annual cost incurred whether custom work is done. However the rate should cover all variable costs which include an allowance for repairs. Labor and profit margin can be adjusted to meet the situation.

3. If you plan to do custom work in addition to your own work, so as to help offset ownership of a larger machine, then the custom charge should cover variable costs plus a profit margin plus a proportion of fixed costs as declared as follows:

   $$\text{Proportion of Fixed Costs} = \frac{\text{Hours of Custom Work}}{\text{Total Annual Hours of Use}}$$

4. If you are renting out machinery then you will want to cover those variable costs such as fuel, lubrication and repairs that are incurred by the renter.

5. If you wish to assess a rate for a full operation such as silage making, which requires several machines, then add the hourly costs of each activity, making sure that there is neither omission nor duplication. Use worksheets on pages 14 to 19.

6. The purchase cost estimates are based on average cash prices as of February, 1989 for each class of machine. These represent current replacement costs which should be budgeted and charged for, even if you do custom work with older machines, unless the older machine will not do a comparable job.

KEY ASSUMTPIONS

1. Estimated years of life, annual hours of use and annual repair rates are specified for each type of machine.

2. Diesel full is charged at $.15 per litre, purple gas at $.18 per litre and propane at $.15 per litre.

3. Return on investment is calculated using a Bank of Canada prime rate of 10% with an additional allowance for risk of 6%. Inflation was included at a 4% rate. Calculations follow the procedures on pages 13 to 18.

4. Income tax considerations have not been included in the calculations.

OTHER CONSIDERATIONS

1. Favorable or unfavorable working conditions such as size of job, distance, access, topography, soil type and possible down time, may modify the guide figures. Per hour charges allow for some of these situations.

2. Charges per unit of output such as per acre, per bushel or per bale, defined on work rates per hour, may be quite different from those quoted. Per hour charging overcomes some of these uncertainties.

3. You can adjust the labor charge according to your actual cost of hired work or the opportunity cost of your own labor.

4. If your experience and farm records suggest that other costs and assumptions would suit your situation, then recalculate using the worksheets on pages 14 to 19.

5. Earlier and faster may be cheaper. There are costs attached to late completion of operations. The rewards for timely quality work, quickly completed by large machines, is only earned if the support system, including seed and fertilizer supplies, and grain trucking, is well organized.

OTHER INFORMATION SOURCES

Custom Rates Survey Summary - 1989, Alberta Agriculture, Agdex 825-9, February 1989
Know Your Farm Machinery Costs, Alberta Agriculture, Agdex 825-6, March 1989
Leasing vs. Buying Farm Machinery, Alberta Agriculture, Agdex 825-19, May 1985
Replacing Farm Machinery, Alberta Agriculture, Agdex 825-18, July 1983
What is A Fair Charge For Custom Work?, Alberta Agriculture, Agdex 825-15, July 1983

TRACTOR - 2WD

Years Life = 13
Annual Use = 200, 400*, 600
Annual Repair Rate = 3% of Replacement Cost

	Annual Hours Used	Diesel Use litres/Hr	Current Replace Cost $	Fixed Cost $/Hr	Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Labor $/Hr	Profit $/Hr	Market Rate Survey 1988
40 HP	200	8	20000	15.85	2.88	18.73			0.22 per HP/HR
	400			7.93		10.81			
	600			5.28		8.16			
60 HP	200	13	24000	19.02	4.04	23.06			
	400			9.51		13.55			
	600			6.34		10.38			
80 HP	200	17	38000	30.12	5.78	35.90			0.20 per HP/HR
	400			15.06		20.84			
	600			10.04		15.82			
100 HP	200	22	56000	44.38	8.00	52.38			
	400			22.19		30.19			
	600			14.79		22.79			
120 HP	200	28	60000	47.55	9.33	56.88			
	400			23.78		33.11			
	600			15.85		25.18			
140 HP	200	32	70000	55.48	10.77	66.25			
	400			27.74		38.51			
	600			18.49		29.26			
160 HP	200	38	79000	62.61	12.48	75.09			
	400			31.30		43.78			
	600			20.87		33.35			
180 HP	200	39	88000	69.74	13.33	83.07			
	400			34.87		48.20			
	600			23.25		36.57			

Front wheel assist option at $8,000-$12,000 adds 3.77-5.66 per hour to total machine cost.

* This Annual Hours use figure is typical.

Years Life = 13
Annual Use = 200, 400*, 600
Annual Repair Rate = 3% of Replacement Cost

TRACTOR - 4WD

	Annual Hours Used	Diesel Use litres/Hr	Current Replace Cost $	Fixed Cost $/Hr	Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Labor $/Hr	Profit $/Hr	Market Rate Survey 1988
	200			69.74		82.21			
175 HP	400	34	88000	34.87	12.47	47.34			
	600			23.25		35.71			
	200			85.59		100.59			
220 HP	400	40	108000	42.80	15.00	57.80			
	600			28.53		43.53			
	200			91.14		108.39			
250 HP	400	50	115000	45.57	17.25	62.82			
	600			30.38		47.63			
	200			99.07		117.58			
275 HP	400	53	125000	49.53	18.52	68.05			0.20 HP/HR
	600			33.02		51.54			
	200			106.99		127.12			
300 HP	400	58	135000	53.50	20.13	73.63			
	600			35.66		55.79			
	200			114.92		136.49			
350 HP	400	62	145000	57.46	21.57	79.03			
**	600			38.31		59.88			
	200			154.54		183.83			
450 HP	400	85	195000	77.27	29.29	106.56			
**	600			51.51		80.80			

* This Annual Hours Use figure is typical.

** Priced without PTO.

CULTIVATION EQUIPMENT

Implement	Tractor HP	Current Replace Cost	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Acre/Hr	$/Acre	Labor $/	Profit $/	Market Rate Survey 1988
PLOWS	Life = 15		Annual Hours Use = 150			Annual Repair Rate = 6% of Replacement Cost						
3 X 16" 3 Point	60	5500	9.51	4.04	5.52	2.20	21.27	2.0	10.63			1800 - 2500 per acre
5 x 16" Semi 3 pt	120	10000	23.78	9.33	10.03	4.00	47.14	3.0	15.71			
6 x 18" Trailing	140	15000	27.74	10.77	15.04	6.00	59.55	4.0	14.89			
8 x 16" Trailing	220	17000	42.80	15.00	17.05	6.80	81.65	6.0	13.61			
10 x 18" Trailing	250	20000	45.57	17.25	20.06	8.00	90.88	7.0	12.98			
HD CULTIVATORS	Life = 15		Annual Hours Use = 250			Annual Repair Rate = 6% of Replacement Cost						
14' Single	80	9500	15.06	5.78	5.72	2.28	28.84	7.0	4.12			3.50 - 5.50 per acre
22' Wing	120	15000	23.78	9.33	9.03	3.60	45.73	11.0	4.16			
31' Wing	160	22000	31.30	12.48	13.24	5.28	62.30	15.0	4.15			
42' Wing	220	28000	42.80	15.00	16.85	6.72	81.37	20.0	4.07			
60' Wing	350	39000	57.46	21.57	23.47	9.36	111.86	30.0	3.73			
FIELD CULTIVATORS	Life = 15		Annual Hours Use = 250			Annual Repair Rate = 6% of Replacement Cost						
16' Wing	60	9000	9.51	4.04	5.42	2.16	21.13	8.5	2.49			
22' Wing	80	13500	15.06	5.78	8.12	3.24	32.20	12.0	2.68			
32' Wing	120	15000	23.78	9.33	9.03	3.60	45.73	17.0	2.69			
42' Wing	160	21000	31.30	12.48	12.64	5.04	61.46	22.0	2.79			
DISCS - TANDEM 60	Life = 15		Annual Hours Use = 150			Annual Repair Rate = 6% of Replacement Cost						
16' Single	120	14000	28.55	8.09	10.34	5.63	49.03	7.5	6.64			
24' Wing	160	20000	37.64	12.12	14.47	8.25	72.48	12.0	6.04			
32'	200	28000	47.74	16.16	18.63	10.63	93.16	16.0	5.82			
42'	250	36000	59.84	20.20	23.47	13.39	116.90	20.0	5.84			

400 Annual Hours of Tractor Use figures are used to determine above implement costs

CULTIVATING, SEEDING & SPRAYING EQUIPMENT

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Acre/Hr	$/Acre	Labor $/	Profit $/	Market Rate Survey 1988
ROD WEEDER/MULTIPLEX	Life = 15		Annual Hours Use = 150			Annual Repair Rate = 6% of Replacement Cost						
24'	100	11000	22.19	8.00	11.03	4.40	45.62	12.0	3.80			
36'	120	15000	23.78	9.33	15.04	6.00	54.15	16.0	3.38			
48'	160	21000	31.30	12.48	21.06	8.40	73.25	25.0	2.93			
HARROWS	Life = 15		Annual Hours Use = 40			Annual Repair Rate = 2% of Replacement Cost						
Spring Tooth 50'	80	8000	15.06	5.78	30.09	4.00	54.93	35.0	1.57			1.75 - 2.50 per acre
Spring Tooth 70'	120	11000	23.78	9.33	41.37	5.50	79.98	48.0	1.67			
Harrow Packers 40'	140	18000	27.74	10.77	67.70	9.00	115.21	25.0	4.61			
Harrow Packers 70'	180	24000	34.87	13.33	90.26	12.00	150.46	44.0	3.42			
SEED DRILLS	Life = 15		Annual Hours Use = 100			Annual Repair Rate = 2% of Replacement Cost						
Press Drills 12'	60	18000	9.51	4.04	27.08	3.60	44.23	6.5	6.80			5.00 - 7.00 per acre
End Wheel 12'	60	10000	9.51	4.04	15.04	2.00	30.60	6.5	4.71			
Hoe Drill 12'	60	18000	9.51	4.04	27.08	3.60	44.23	6.5	6.80			
Zero/Min. Till 12'	60	23000	9.51	4.04	34.60	4.60	52.75	4.5	11.72			
AIR SEEDER W/CULT.	Life = 15		Annual Hours Use = 150			Annual Repair Rate = 3% of Replacement Cost						
28'	140	39000	27.74	10.77	39.11	7.80	85.42	16.5	5.18			
42'	250	58000	45.57	17.25	58.17	11.60	132.59	25.0	5.30			
45' WITH PACK WHEELS	250	75000	45.57	17.25	75.22	15.00	153.04	27.0	5.67			
SPRAYER (TRAILER)	Life = 15		Annual Hours Use = 50			Annual Repair Rate = 3% of Replacement Cost						
400 Gallon 68'	60	10000	9.51	4.04	30.09	6.00	49.64	35.0	1.42			
800 Gallon 80'	60	12000	9.51	4.04	36.11	7.20	56.86	47.0	1.21			
SPRAYER (SP)	Life = 10		Annual Hours Use = 100			Annual Repair Rate = 3% of Replacement Cost						2.50 - 3.50 per acre
130 Gallon 54'	60	22000	39.12	6.60			45.72	40.0	1.14			
1000 Gal 54' Float	160	120000	213.39	36.00			249.39	85.0	2.93			
320 Gallon 45' + 3/4 Ton 4x4	60	28000	49.79	8.40			58.19	35.0	1.66			

400 Annual Hours of Tractor Use figures are used to determine above Power Unit Costs.

FORAGE EQUIPMENT

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Acre/Hr	$/Acre	Labor $/	Profit $/	Market Rate Survey 1988
SWATHER (SP)	Life = 15		Annual Hours Use = 100			Annual Repair Rate = 3% of Replacement Cost						
16' Forage & Grain + Conditioner	60	38000	57.17	13.64			70.81	7.0	10.12			
20' Grain	60	34000	51.15	12.44			63.59	10.0	6.36			
SWATHER (PULL-TYPE)	Life = 15		Annual Hours Use = 100			Annual Repair Rate = 3% of Replacement Cost						4.50 - 6.50 per acre
15' Grain	40	6500	7.93	2.88	9.78	1.95	22.53	7.5	3.00			
18' Grain	60	10000	9.51	4.04	15.04	3.00	31.60	10.0	3.16			
24' Grain	60	12000	9.51	4.04	18.05	3.60	35.21	12.0	2.93			
MOWER	Life = 15		Annual Hours Use = 50			Annual Repair Rate = 2% of Replacement Cost						
7'	40	5500	7.93	2.88	16.55	2.20	29.55	3.0	9.85			
MOWER CONDITIONER	Life = 15		Annual Hours Use = 100			Annual Repair Rate = 3% of Replacement Cost						
14' SP Diesel	70	47000	70.71	16.92			87.63	7.0	12.52			
9' PTO	60	14000	9.51	4.04	21.06	4.20	38.81	5.0	7.76			6.00 - 10.00 per acre
14' PTO	80	22000	15.06	5.78	33.10	6.60	60.54	6.5	9.31			
RAKE	Life = 15		Annual Hours Use = 50			Annual Repair Rate = 2% of Replacement Cost						
9' Parallel Bar	40	5000	7.93	2.88	15.04	2.00	27.85	5.0	5.57			
FORAGE HARVESTER	Life = 12		Annual Hours Use = 100			Annual Repair Rate = 3% of Replacement Cost						
20"	120	20000	23.78	9.33	32.75	6.00	71.85					95 - 125 per hour
26"	180	28000	34.87	13.33	45.85	8.40	102.45					
DUMP WAGON	Life = 15		Annual Hours Use = 100			Annual Repair Rate = 2% of Replacement Cost						
Small (700 cu ft)	0	11500	17.30	2.30			19.60					
Large (900 cu ft)	0	15000	22.57	3.00			25.57					

400 Annual Hours of Tractor Use figures are used to determine above Power Unit Costs.

BALING EQUIPMENT

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Bales/Hr	$/Bale	Twine Cost $/Bale	Total Cost $/Bale	Labor $/	Profit $/	Market Rate Survey 1988
BALERS (STANDARD)	Life = 10		Annual Hours Use = 80			Annual Repair Rate = 3% of Replacement Cost								
Small 14" x 18"	40	12000	7.93	2.88	26.67	4.50	41.98	200	0.21	0.08	0.29			0.30 - 0.40 per bale
Large 16" x 18"	60	19000	9.51	4.04	40.01	6.75	60.31	300	0.20	0.08	0.28			
LARGE ROUND	Life = 12		Annual Hours Use = 60			Annual Repair Rate = 2% of Replacement Cost								
800 Lb. Bale	50	18000	9.51	4.04	49.12	6.00	68.67	18	3.81	0.40	4.21			1.50 - 6.50 per bale
1500 Lb. Bale	60	24000	9.51	4.04	65.50	8.00	87.05	16	5.45	0.40	5.95			
BIG SQUARE	Life = 10		Annual Hours Use = 150			Annual Repair Rate = 3% of Replacement Cost								
1500-2000 Lb. Bale	160	79000	31.30	12.48	93.66	15.80	153.24							10.00 - 12.00 per bale
BALE WAGONS	Life = 12		Annual Hours Use = 80			Annual Repair Rate = 3% of Replacement Cost								
SP 160 Bale DS	40	75000	153.50	28.13			181.63	400	0.45	0.00	0.45			
PULL 142 Bale	80	28000	15.06	5.78	57.31	10.50	88.65	300	0.30	0.00	0.30			0.20 - 0.30 per bale
PULL 104 Bale	60	22000	9.51	4.04	45.03	8.25	66.83	240	0.28	0.00	0.28			
PULL 55 Bale	40	15000	7.93	2.88	30.70	5.63	47.13	160	0.29	0.00	0.29			
STACKERS	Life = 12		Annual Hours Use = 80			Annual Repair Rate = 3% of Replacement Cost								
4 ton Rectangular	80	20000	15.06	5.78	40.93	7.50			69.27					
8 ton Rectangular	120	28000	23.78	9.33	57.31	10.50			100.91					

400 Annual Hours of Tractor Use figures are used to determine above Power Unit Costs.

COMBINES

Years Life = 13
Annual Use = 100, 150*, 200
Annual Repair Rate = 3% of Replacement Cost

Combine Cylinder Width	Annual Hours Use	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine $/Hr	Machine Acre/Hr	Cost $/Acre	Labor $/	Profit $/	Market Rate Survey 1988
POWER TAKE OFF	100				71.33		113.43		18.91			
44-50 IN CYLINDER	150	45000	23.78	9.33	47.55	9.00	89.66	6.0	14.94			
(Tractor HP = 120)	200				35.66		77.77		12.96			
LARGE PTO	100				118.68		182.08		21.42			
	150	75000	34.87	13.33	79.25	15.00	142.45	8.5	16.76			
(Tractor HP = 180)	200				59.44		122.64		14.43			
SP DIESEL	100		126.80				146.60		26.65			
45 INCH	150	80000	84.54	19.80			104.33	5.5	18.97			
(HP = 100)	200		63.40				83.20		15.13			
SP DIESEL	100		150.58				174.41		26.83			
50 INCH	150	95000	100.39	23.83			124.22	6.5	19.11			
(HP = 120)	200		75.29				99.12		15.25			
SP DIESEL	100		174.36				201.88		23.75			12.00 - 20.00
60 INCH	150	110000	116.24	27.52			143.76	8.5	16.91			per acre
(HP = 140)	200		87.18				114.70		13.49			
ROTARY TYPE	100		166.43				192.95		27.56			
(SMALL)	150	105000	110.95	26.52			137.47	7.0	19.64			
	200		83.22				109.74		15.68			
ROTARY TYPE	100		198.13				229.00		26.94			
(MEDIUM) (HP = 175)	150	125000	132.09	30.87			162.95	8.5	19.17			
	200		99.07				129.93		15.29			
ROTARY TYPE	100		226.65				261.99		27.58			
(LARGE) (HP = 250)	150	143000	151.11	35.33			186.44	9.5	19.62			
	200		113.33				148.66		15.65			
ROTARY TYPE	100		50.41				290.56		27.68			
(LARGEST) (HP = 340)	150	150000	196.95	40.13			207.18	10.5	19.73			
	200		126.22				165.44		15.77			

* This Annual Hours Use figure is typical

400 Annual Hours of Tractor Use is used to determine above Power Unit

GRINDERS, MIXERS & DRYERS

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Tonne/Hr	$/Tonne	Labor $/	Profit $/	Market Rate Survey 1988
TUB GRINDER	Life = 12		Annual Hours Use = 80			Annual Repair Rate = 3% of Replacement Cost						
15 Tons/Hour	80	18000	15.06	5.78	36.84	6.75	64.43	15.0	4.30			
25 Tons/Hour	140	25000	27.74	10.77	51.17	9.38	99.05	25.0	3.96			
PORTABLE GRINDER/MIX	Life = 10		Annual Hours Use = 80			Annual Repair Rate = 3% of Replacement Cost						
20" Screen	80	12000	15.06	5.78	26.67	4.50	52.01					
24" Screen & Bale Shredder	100	17000	22.19	8.00	37.79	6.38	74.35					

GRAIN DRYERS	Life = 12		Annual Hours Use = 200			Annual Repair Rate = 3%		Moisture Drop 20-14% $/Tonne	Moisture Drop 17.5-14% $/Tonne
RECIRCULATING BATCH									
Small Propane = 37 L/Hr	40	15000	7.93	2.88	12.28	8.91	32.00	24.61 (1.3T/Hr)	16.00 (2.0T/Hr)
Medium Propane = 46 L/Hr	40	20000	7.93	2.88	16.37	11.28	38.46	22.62 (1.7T/Hr)	14.79 (2.6T/Hr)
Large Propane = 90 L/Hr	40	38000	7.93	2.88	31.11	21.90	63.82	15.95 (4.0T/Hr)	10.64 (6.0T/Hr)
CONTINUOUS FLOW									
Small Propane = 91 L/Hr	60	25000	11.90	4.32	21.29	20.10	52.39	25.92 (3.3T/Hr)	18. (5.0T/Hr)
Medium Propane = 114 L/Hr	75	32000	14.82	5.38	30.29	25.35	66.45	20.10 (5.1T/Hr)	14. (7.7T/Hr)
Large Propane = 45 L/Hr	45	56000	26	9.48	48.03	34.45	90.16	12.87 (8.5T/Hr)	9.20 (12.4T/Hr)

400 Annual Hours of Tractor Use figures are used to determine above Power Unit Costs.

FARM TRUCKS

Years Life = 13
Annual Use = 150, 300*, 450
Annual Repair Rate = 3% of Replacement Cost

TRUCK SIZE	Annual Hours Used	Diesel Use litres/Hr	$	Current Replace Cost $/Hr	Fixed Cost $/Hr	Variable Cost $/Hr	TOTAL Truck Cost $/Hr	Labor $/Hr	Profit $/Hr	Market Rate Survey 1988
GENERAL TRUCKING										
2 Ton	150				24.07		32.68			
	300	30		24000	12.04	8.61	20.65			
	450				8.02		16.63			
3 Ton	150				29.08		39.64			
	300	37		29000	14.54	10.56	25.10			
	450				9.69		20.25			
4 Ton	150				35.10		47.92			
	300	45		35000	17.55	12.82	30.37			
	450				11.70		24.52			
5 Ton Tandem	150				45.13		60.40			
	300	52		45000	22.57	15.26	37.83			
	450				15.04		30.31			

* This Annual Hours Use figure is typical.

ROCK PICKERS, VACUVATORS

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Acre/Hr	$/Acre	Labor $/	Profit $/	Market Rate Survey 1988
ROCKER PICKER	Life = 10		Annual Hours Use = 150			Annual Repair Rate = 6% of Replacement cost						
REEL TYPE	60	8500	9.51	4.04	10.08	3.40	27.03					
ROCK RAKE	60	6500	9.51	4.04	7.71	2.60	23.86					
RAKE - PICKER COMBO	80	14000	15.06	5.78	16.60	5.60	43.04					

VACUVATORS

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Bu/Hr	$/Bu	Labor $/	Profit $/
VACUVATORS	Life = 15		Annual Hours Use = 150			Annual Repair Rate = 3% of Replacement Cost					
SMALL	80	10000	15.06	5.78	10.03	2.00	32.87	700	0.05		
LARGE	100	16000	22.19	8.00	16.05	3.20	49.43	1800	0.03		

*400 Annual Hours of Tractor use figures are used to determine above Power Unit Costs.

MACHINERY COST

Section 1: On the top of the sheet record all the information needed to calculate ownership and operating costs.

Term	Line	Information Required
Machine description		the machine and model
Today's new price	A	the suggested retail price of the desired machine (new or used)
Planning period	B	the number of years the machine will be owned
Today's used price	C	the price of a used machine that is similar to the new desired machine and as old as the planning period
Prime interest rate	D	the Bank of Canada prime rate of interest
Risk premium	E	a value estimate which represents the additional risk of the project over and above the basic prime rate of interest
Marginal tax rate	F	the expected marginal tax rate of the farm business during the planning period
Rate of inflation	G	the current rate of inflation e.g. the consumer price index
Discount factor	H	value used to arrive at the present value (dollar amount) of the future salvage value of the new machine - calculated on the reverse of the worksheet
Capital cost allowance class percentage	I	the appropriate percentage rate for the machine (tax purpose depreciation)
Capital cost allowance adjustment factor	J	value used to arrive at the after tax capital outlay as well as the after tax salvage value
Capital recovery factor	K	value that recovers that capital value of the machine through time with the specified real return - calculated on the reverse side of the worksheet

Section 2: Calculates ownership on a yearly and hourly basis

Description	Line	Calculations
Capital recovery	1	calculates the capital value decline with a real return on investment
Insurance and housing	2	Line A x 1%
Total ownership costs per year	3	Line 1 + Line 2
Total ownership costs per hour	4	Line 3 divided by annual hours of use

Section 3: Calculates operating costs on an hourly and yearly basis

Description	Line	Calculation
Fuel cost	5	the expected fuel consumption x the price of fuel X (1 - marginal tax rate)
Lubrication	6	Line 5 x 15% X (1 - marginal tax rate)
Repair costs	7	the average repair cost per year divided by annual hours of use X (1 - marginal tax rate)
Total operating costs per hour	8	Line 5 + Line 6 + Line 7
Total operating costs per year	9	Line 8 multiplied by annual hours of use

Section 4: Calculates total operating costs for the hour and year

Description	Line	Calculation
Total cost per year	10	Line 3 + Line 9
Total cost per hour	11	Line 4 + Line 8

MACHINERY COST WORKSHEET

Machine description:_____

Todays new Price $_____ (A)
Used price $_____ (C)
Risk premium_____%(E)
Rate of inflation_____%(G)
CCA class rate_____%(I)
Capital recovery factor (from reverse)_____(K)

Planning period_____Years(B)
Prime interest rate_____%(D)
Marginal tax rate_____%(F)
Real discount factor (from reverse)_____(H)
CCA adjust factor (from reverse)_____(J)

OWNERSHIP COSTS (Calculated on yearly basis)	YEARLY COST	HOURLY COST
1. Capital recovery = [(Line A x Line J) - (Line C x Line J x Line H)] x Line K = $(_____ x _____) - (_____ x _____ x _____) x _____ =	$_____	
2. Insurance and housing = today's new price x 1% = $_____ x _____% =	$_____	
3. Total ownership costs per year	$_____	
4. Total ownership costs per hour = total costs per year ÷ hours of annual use = $_____ ÷ _____hours =		$_____
OPERATING COSTS (Calculated on hourly basis)		
5. Fuel cost = litres/hr (gal/hr) x price per litre (price per gallon) x (1 - Line F) = _____ x $_____ x _____ =		$_____
6. Lubrication = fuel cost x 15% x (1 - Line F) = $_____ x _____% x _____ =		$_____
7. Repairs = average annual repair cost ÷ hours of annual use x (1 - Line F) = $_____ ÷ _____hours x _____ =		$_____
8. Total operating costs per hour		$_____
9. Total operating costs per year = total operating costs/hour x hours of annual use = $_____ X _____hours =	$_____	
10. Total costs per year (line 3 + line 9) = $_____ + $_____ =	$_____	
11. Total costs per hour (line 4 + line 8) = $_____ + $_____ =		$_____

REAL DISCOUNT RATE

$$= \left[\frac{(1 + \text{Line D} + \text{Line E})}{1 + \text{Line G}} - 1 \right] (1 - \text{Line F})$$

$$= \left[\frac{(1 + \quad + \quad)}{1 + \quad} - 1 \right] (1 - \quad)$$

= _____ (M)

REAL DISCOUNT FACTOR

$$= [1 + (1 + \text{Line M})]^{\text{Line B}}$$

$$= [1 + (1 + \quad)]^{\quad}$$

= _____ (transfer to Line H)

CCA ADJUST FACTOR

$$= 1 - \left[\frac{\text{Line I X Line F}}{\text{Line I} + \text{Line M}} \right]$$

$$= 1 - \left[\frac{\quad X \quad}{\quad + \quad} \right]$$

= _____ (transfer to Line J)

CAPITAL RECOVERY FACTOR

$$= \frac{\text{Line M}}{1 - \text{Line H}}$$

$$= \frac{\quad}{1 - \quad}$$

= _____

MACHINERY COST WORKSHEET

Machine description:
40 HP Tractor
400 hours per year
8 litres per hour @ 15¢/litre
average $/yr repair cost .3% of New Price

Todays new Price $20,000 (A)
used price $2,000 (C)
Risk premium 6 %(E)
Rate of inflation 4 %(G)
CCA class rate 30 %(I)
Capital recovery factor (from reverse) .275 (K)

Planning period 13 Years(B)
Prime interest rate 10 %(D)
Marginal tax rate 0 %(F)
Real discount factor (from reverse) .243 (H)
CCA adjust factor (from reverse) 1 (J)

	YEARLY COST	HOURLY COST
OWNERSHIP COSTS (Calculated on yearly basis)		
1. Capital recovery = [(Line A x Line J) - (Line C x Line J x Line H)] x Line K = $(20,000 x 1) - (2,000 x 1 x .243) x .152 =	$2,966	
2. Insurance and housing = today's new price x 1% = $20,000 x 1% =	$ 200	
3. Total ownership costs per year	$3,166	
4. Total ownership costs per hour = total costs per year ÷ hours of annual use = $5,566 ÷ 400 hours =		$ 7.92
OPERATING COSTS (Calculated on hourly basis)		
5. Fuel cost = litres/hr (gal/hr) x price per litre (price per gallon) x (1 - Line F) = 8 x $.15 x 1 =		$ 1.20
6. Lubrication = fuel cost x 15% x (1 - Line F) = $1.20 x .15% x 1 =		$ .18
7. Repairs = average annual repair cost ÷ hours of annual use x (1 - Line F) = $600 ÷ 400 hours x 1 =		$ 1.50
8. Total operating costs per hour		$ 2.88
9. Total operating costs per year = total operating costs/hour x hours of annual use = $2.88 x 400 hours =	$1,152	
10. Total costs per year (line 3 + line 9) = $3,166 + $1,152 =	$4,318	
11. Total costs per hour (line 4 + line 8) = $7.92 + $2.88 =		$ 10.80

REAL DISCOUNT RATE

$$= \left[\frac{(1 + \text{Line D} + \text{Line E})}{1 + \text{Line G}} - 1\right] \quad (1 - \text{Line } _)$$

$$= \left[\frac{(1 + .10 \quad + .06 \quad)}{_ \quad + .04} - 1\right] \quad (1 - 0 \quad)$$

____ .115 ____ (M)

REAL DISCOUNT FACTOR

$$= [1 \div (1 + \text{Line M})]^{\text{Line B}} \quad -$$

$$= [1 \div (1 + .115)]^{13}$$

= __ .243 ___ (transfer to Line H)

CAPITAL ADJUST FACTOR

$$= 1 - \left[\frac{\text{Line I} \times \text{Line F}}{\text{Line J} + \text{Line M}}\right]$$

$$= 1 - \left[\frac{.3 \quad \text{X} \quad 0}{.3 \quad + .115}\right]$$

= _____ 1 (transfer to Line J)

CAPITAL RECOVERY FACTOR

$$= \frac{\text{Line } _}{1 - \text{Line } _}$$

$$= \frac{.115}{1 - .243}$$

= __.152

FUEL CONSUMPTION FOR VARYING TRACTOR HORSEPOWER[1]

TRACTOR TYPE AND SIZE	AVERAGE DRAWBAR HORSEPOWER[2]		AV. FUEL CONSUMPTION[3] (Litres per Hour)	
	Diesel Tractors	Gasoline Tractors	Diesel Tractors	Gasoline Tractors
Two Wheel Drive PTO HP				
30 - 39	....	31.5	....	10.5
40 - 49	....	38.3	....	12.3
50 - 59	48.2	47.1	10.5	15.0
60 - 69	56.2	55.2	13.6	20.0
70 - 79	65.5	64.5	16.4	23.2
80 - 89	73.5	74.5	17.7	26.8
90 - 99	84.0	82.0	20.5	28.2
100 - 119	90.3	....	22.7	....
120 - 139	111.6	....	28.2	....
140 - 159	128.9	....	32.3	....
160 - 179	145.8	....	38.6	....
Over 180	148.9	....	39.1	....
Four Wheel Drive DBHP				
100 - 149	135.0	....	33.2	....
150 - 174	159.4	....	40.3	....
175 - 199	182.8	....	50.0	....
200 - 224	217.4	....	53.0	....
225 - 249	235.5	....	58.0	....
250 - 274	265.0	....	61.4	....
275 - 299	281.3	....	62.6	....
300 - 349 *	305.0	....	66.4	....
Over 350 *	385.0	....	92.4	....

* Includes only one tractor

NOTES ON FUEL CONSUMPTION TABLE

This data on fuel consumption for different sizes of tractors was calculated from the Nebraska Tractor Tests Reports. The fuel consumption figures are based on "75% of Pull at Maximum Power". These fuel consumption figures are for tractors under normal load in average field conditions. Fuel use per hour will be affected by:-

- load factor (75% is assumed in these estimates
- engine RPM
- gear
- correct engine tuning

While these figures may be a good indication of fuel use per hour for a machine, fuel consumption per acre will be affected by the Field Efficiency related to each operation. Estimation of total fuel consumption should take this factor into account. Some factors that can significantly affect field efficiency include:-

- wheel slippage
- tire pressure
- tractor ballast
- depth of and sharpness of implement
- soil type and condition
- amount of turning required
- implement overlap in each pass
- down time to refill seed and fertilizer boxes

1 This data was summarised from "Nebraska Tractor Test Summary 1972 through 1981", The Grain Grower, Page 762 (UGG), April, 1982 and from 1980 - 1981, Agricultural Yearbook, A.S.A.E, May, 1980, pp 537-545.
2 Average Drawbar Horsepower for all tractors in each range.
3 Average fuel consumption for all tractors in each range.

MACHINERY COSTS ASSUMPTION GUIDE

MACHINE	A Depreciation Lifetime (Years)	B Annual Use (Hours)	C Annual Repair rate % orig.Cost	D Lifetime Repairs % orig.Cost	E Field Efficiency
Tractors	13	600	3%	120%	.....
Combines	12	150	3%	60%	60 - 80%
Cultivators	15	250	3-8%	120%	70 - 90%
Discers	15	150	3%	120%	70 - 90%
Rodweeders	15	100	2%	100%	70 - 90%
Seed Drills	15	100	2%	100%	65 - 80%
Harrows, Packers	15	40	2%	120%	70 - 90%
Sprayers	15	50	2%	80%	50 - 80%
Stone Pickers	15	40	2%	100%	50 - 80%
Swathers	15	100	3%	95%	70 - 85%
Mowers & Rakes	15	50	2%	100%	60 - 90%
Mower-Condtioner	15	50	2%	100%	60 - 85%
Forage Harvester	15	80	3%	80%	50 - 80%
Balers					
Standard	10	80	3%	80%	60 - 85%
Large Round	12	60	2%	60	60 - 85%
Grain Dryers	12	200	3%	...	.....
Loaders	15	40	2%	90%	.....

NOTES ON COLUMN HEADINGS

A. Estimated average number of years until a machine depreciates to 10% of original cash cost.

B. Estimated average annual farm use.

C. Estimates are based on average conditions and the indicated annual hours of use.

D. Total repairs as a percent of the original cash cost. Repairs are usually low in the first years before they begin to increase at an increasing rate as the machine wears out. These figures could be viewed as a maximum since they reflect high rates in later years.

E. Field Efficiency is a percentage estimate of the amount of time machinery is actually in use relative to the total time required to complete an operation (refer also opposite page).

RES PER HOUR

res per hour (or "Effective Field Capacity") can be calculated using e following formula:-

$$\text{Acres per hour (Effective field Capacity)} = \frac{\text{machine width (ft) x speed (mph) x field efficiency}}{8.25}$$

E.G. A 31' cultivator travelling at 5 m.p.h. operating at 80% field efficiency would have an effective field capacity of:-

$$\text{Acres per hour} = \frac{31 \times 5 \times .80}{8.25} = 15 \text{ ac/hr}$$